

38 THE AUSTRALIAN EXPERIENCE: SUMMARY AND PROSPECT

R.W. Kates

ABSTRACT

A review of the meetings at the Symposium on Natural Hazards in Australia is presented. The success of the meetings in encouraging the communication of the wide-ranging experience of natural hazards and providing a historical perspective to hazard adjustments is noted. Missing from the meetings, however, were sophisticated studies of hazard impacts, extensive consideration of disaster prevention, and a clear image of the characteristics of the human victims. Problems facing future research were noted as: the need to be aware of the researchers' own interests in their studies; the mobile character of western societies wherein community continuity masks discontinuities of individual experience of hazardous environments; and the need to recognise that individual cognition of hazards has to be seen in the context of the multiple other stresses facing an individual during his or her lifetime.

INTRODUCTION

I was a little fuzzy from overseas travel when I got my instructions from our convenor, Dr Heathcote, but I will try to express them to you as best I remember. In a gentle way he told me what he wanted said at the end of the symposium, and in summary I think these were his words:

Pat 'em on the back,
Summarise what's said,
Take 'em down a notch,
And push 'em on ahead.

And that's what I propose to do, starting with the second instruction, to 'summarise what's said'.

SUMMARY

I don't plan to summarise all of the papers, but I'd like to at least recapitulate the first session.* I've taken just four lines from each of the papers in the order in which they were presented.

The quaternary is a special Thom
For him who knows its meaning.
Sometimes it's warm; sometimes it's cold;
Sometimes it's in between.

* The first session of the Symposium comprised the papers which formed the bases for chapters 3 to 9 of this volume. *Editor.*

There are atmospheric factors that make things worse,
There are those that make things better,
But the only way to tell which from which
Is when they're preceded by a small letter.

Some years it rains much too much,
Some years it's just sufficient.
But the only time we call a drought
Are the years severely deficient.

Fire control without burning
Is a disaster recipe
To make the ordinary bushfire
A flambeau of calamity.

Far from the major plate boundaries,
The puny Australian plate
Fails to give to the people
Their rights to a proper shake.

There are winds that blow in knots,
There are winds that blow in metres,
But the strangest winds that blow at all
Are the winds that blow in kneters.

It never rains with time or reason,
It's drought this year and flood next season.
But Gov. Macquarie says that ain't so,
It's humans that make disaster go.

So much for the summary. Now a few pats on the back.

ACHIEVEMENTS

First of all, I would like to remark on the special qualities of this meeting. Considering my own country, the United States, and the enormous difference in size, activity, and the availability of research support, it is still only within the last three years that we've had any meetings that are comparable to this one. It is only recently that we have brought together people from the academic communities, from local government, from industry, and from the insurance corporations, in a similar setting.

But even more impressive is the genuine openness of the participants to other disciplines and other perspectives. People in Australia have been tackling problems and drawing their inspirations from where they can be found. This comes through in many of the groups represented here. The engineers appear aware of the needs for comprehensive damage reduction. They are alert, not only to the possibilities for structural changes to prevent damages, but for non-structural alternatives as well. And they appear willing to double as social scientists when they think that is appropriate, as, for example, in studying what actually happens to a flood warning.

The welfare and helping community represented here have evidenced a high level of sensitivity in helping victims and have also provided us with the beginning of a provocative exchange. Dr Raphael informed us of the growing interest and efforts of professionals in psychology and psychiatry, in trying to help reduce the emotional tolls of natural disasters. I thought the kind of suggestions she made were commonsensical, and how useful it would be to have her help in trying to manage a disaster crisis.

This approach also points up a significant difference to that represented by the papers of Short and of Western and Milne. The psychological discipline tends to focus on the stressful needs, anxieties, and indeed the neuroses, that are generated by disasters. Sociologists tend to emphasise the resourcefulness and the self-sufficient qualities of disaster victims. And last night we had still another image that emphasised the heroic qualities of the people

in disasters. All of these images have some validity - anxious, resourceful, heroic - what qualities of the disaster victim should we address?

It is not simply a question for professionals as we have among us still another image, that of the attractive victim represented by Mrs Dalitz. Her experience and words of concern were moving but not unique. The proposals made in the text of her paper were. In my own country, we have just had the first emergence of a militant organised group of victims. Hurricane 'Agnes', which was the largest natural disaster in the history of the country, posed a special problem to its many middle class victims. For the first time, they found themselves on welfare lines, where supposedly only poor people are to be found. With a great sense of indignation for the indignities encountered, they organised, and raised high their collective voice. But in this and other cases, the victims almost always organise around their particular needs and concerns. What impressed me about the work of Mrs Dalitz and her group is that they seem to transcend the particular in the proposals that they have made - especially for ways of reducing damages and for damage prevention.

Turning now to another source of insight, I found especially rewarding the depth of historical tradition that was reflected in many of the studies presented. In studies of soil erosion, studies of drought, or in reference to historical events and personages, a larger perspective was introduced. This historical perspective is frequently missing in my own country. At times, one gets the impression that floods never occurred before 1936 or droughts before 1933. Related to this historical perspective of the historian and historical geographer has been my sense of how useful the geographers seem to be in their bringing together the social and physical sciences. They seem to provide a special matrix that lubricates this kind of disciplinary coming-together. They seem to be able to stand on both sides of disciplinary fences and to understand a great deal from both ends of the spectrum of the natural and human sciences.

The hazard warning services seems deserving of praise. It appears that there has been a significantly greater emphasis in Australia not solely on warning, but on informing people as to what measures to use to protect themselves and their property. I had seen the film that was shot in Darwin many months ago in the States, and one striking thing about that film was the recording of the actual warning. Instructions were given about what kind of action one should take to respond to the warning. Our warning services still do not provide useful information along with the warning, as to what kinds of protective actions people can take. I did learn in informal conversation that Darwin was not necessarily typical because there was a local warning centre at Darwin. Still, I was told there are not many warnings that go out that don't have protective advice. In any event, I am still impressed. There is a special need not only to tell people what to be afraid of, but also to try to tell them how they can help themselves.

OMISSIONS

Now I'd like to try and take you down a notch. There are three things which come to my mind - three missing elements in the content of this particular meeting.

IMPACT ANALYSIS

The first omission is the lack of any really sophisticated impact analysis. One still doesn't know, one still can't sum up, what the real impact of natural hazards is in Australia. If you want to make a case for organising a natural hazard council, one still has to depend upon emotion and anecdotes rather than a thoughtful summation of what the annual toll from natural hazards is in the country.

In what impact analysis has been made, people have been focusing much too much on damages, and not on the concept of the social cost. The total cost of hazards, which includes not only what one loses, but also the amount of effort that goes into avoiding losses, hasn't entered into the general calculus of the papers presented here. Thus, while it may be quite true that drought losses are coming down, or that they are only a small percentage - one-tenth of one percent - of the gross national product, one has to also include the substantial activities of the Australian farmer to prevent drought losses. And for a total

calculation for the country, you need to be measuring and estimating how much effort - human effort, social effort - goes into preventing and avoiding the losses, and to add the value of that effort to the damages as they occur. There may be a general consensus that Australia is particularly hazard-prone, but it would seem to me that a sober overall assessment remains to be made.

The issue of the average versus catastrophic losses hasn't been adequately explored. Not all losses are the same, they come in different packages. We know that all over the world the thrust is to make nature amenable and to contain nature. We seek to make life more constant, to eliminate the variability of nature whether it's in our buildings and structures, or whether it's in our daily lives. Each year, each of us gets less and less exposed to the ups and downs of a natural world. But we do not know whether such activity is basically counter-productive in some sense, whether such activity may indeed increase the catastrophic losses, so we may have fewer disaster events but bigger disasters as a result. That trend of fewer but larger disasters needs to be watched very very carefully, because it is a trend that indicates that other social policies may be proving counter-productive. And from what I have heard, there isn't the kind of data collection that would enable us to decide whether that process is at work here in Australia.

Still another untouched impact issue is that of distribution; only a few speakers referred to it, particularly Professor Douglas. Simply stated, it is the issue of who wins and who loses in natural disasters. It is just not true that disasters are great levelers, although we like to think so. We like to think we all pull together and that we are all in support of each other. But as Mrs Dalitz noted, that just isn't the way it is.

We have just finished a major study comparing reconstruction following disaster, two recent cases, Managua (Nicaragua) following the earthquake of 1972 and the Rapid City (North Dakota) flood of 1972, with historic reconstructions of earthquake in San Francisco and Anchorage (Alaska). Our studies show that the role of disaster is to accelerate ongoing trends. Thus, if an area is going downhill agriculturally, the effect of the flood may be to accelerate that kind of de-population. If the rich are getting richer, and the poor are getting poorer, the function of disaster may be to accelerate that trend. Therefore, if one wants to avoid adding insult to injury in disaster, one must add a very special sensitivity to the equity implications of the disaster. Without it, you may overlook various groups in the society who for one reason or another may be marginal, and may need special help and attention. We should identify and learn who wins, who loses, which groups gain - and there are many groups who do gain. We learned that Australian airlines had a sizeable profit out of Darwin, one needs to account for that. It may run against national myth that would like to suggest that no one wins out of the disaster, but to avoid doing so is to be inaccurate and misleading.

Finally, there is little or no study of interactive effects of both short and long run trends. Take, for example, drought. There is an obvious inter-relationship between price and drought in the fluctuation of world prices. The hazard of price fluctuations is the functional equivalent of drought for some farmers. One needs to look at the decline in the relative importance of agriculture in this country, to relate that to the natural hazard vulnerability and to the agricultural community.

Or, for another example, one needs to look at rural-urban migration trends - does it increase or decrease natural hazard vulnerability? Yours is an enormously urbanised country, with a thin scatter of rural population. As you concentrate people in suburbs, expose them to land-slip or bush-fire, what is the effect overall of vulnerability in Australia? There are many other examples of how hazard vulnerability affects such long term trends.

DISASTER PREVENTION AND ADJUSTMENT

A second missing element is the lack of focus on disaster prevention and adjustments. There are few papers on adjustments to hazards. The exceptions were a few papers on buildings and on proposals for flood-plain mapping. There was no basic paper on insurance, although as we heard from prior discussions, there is great interest here in insurance schemes. There was no survey of land use regulation. There were many references and tidbits, but I never found out whether land use regulations are common or uncommon or whether they differ from state to state. To what extent are they utilised? And there was no focus on differences in state policy, again, only slight suggestions. For example, Western

Australia had a very different approach to prescribed burning than the rest of the country. How did that come about, does it make a difference? In general, the states were treated as a homogeneous mass. In the absence of political scientists amongst us, I suggest that we have not begun to look usefully at interstate differences.

Every nation needs to examine the kinds of adjustments they are directing their research efforts towards. Should CSIRO be working on buildings with their five year building plan? Does it happen just because there is a building research group? What adjustments fall between the empty spaces, if you like, simply because there isn't any agency with the mission to examine that adjustment. If you can get your natural hazard council going, one of its first tasks might be to make a simple list of what are the most promising ways of disaster prevention. Then it should examine how much work is going on in each of these areas, asking all the time whether there are some things falling in between the stools?

THE NATURE OF THE DISASTER VICTIM

The third missing element was most striking to me, being no less a failure to appreciate the very special kind of schizophrenia at work among us. There was an enormous ambivalence demonstrated here as to the nature, the human nature, of the disaster victim, both actual and potential. If I were the 'little prince', and I'd come down from another planet, and sat here listening to you, I would have heard the following: The disaster victim is heroic, the disaster victim is resourceful, the disaster victim is a rationaliser. But the potential victim is uninformed, is apathetic, is irrational, is fatalistic. In addition to the actual and potential victim, there is a 'phony' victim who is a manipulator, hurtful, takes benefits that don't belong to him, or asks for things that he does not deserve. Now as a social scientist (and the little prince was a very good one) the obvious question would be: How is it that this uninformed, apathetic, fatalistic person has a disaster and all of a sudden becomes transformed into a heroic or resourceful individual?

There is, first of all, the ever present danger that we are projecting our own values upon the people we are interested in either studying, helping or working with. All of us should be aware of the tendency towards personal and professional self-aggrandisement. All of us are professionally committed to a concern for hazards. They are very important to us, our lives revolve around them. And when we project that involvement onto others, we wonder - why aren't they as concerned as we are? We then come up with judgments such as 'they' are fatalistic or apathetic, or 'they' are uninformed and need education.

On my way to Australia, I visited the Severe Storms Laboratory in northern Oklahoma, where they have just established an enormous array of doppler and airborne radar. One hundred rain gauges report to three on-line computers. Planes put chaff into the clouds and measure winds. Teams are sent out to chase and photograph each tornado. Sixty people are mobilised every promising day to identify the tracks of these tornados. I asked them 'how was the tornado season?' They said 'it was disastrous'. I said 'Oh, you've had quite a few?' They said 'No, we've had none at all'. All of us share in that tendency. In my household someone looks up from the paper and says 'there's an earthquake in Guatemala'. And I almost, but not quite, reply 'Good'. Because it's our work, it's our business, it's another chance to observe.

Thus we have to be doubly wary that we don't project our own professional commitment onto other people, and then infer that they act in an irrational way when they seem to minimise their hazards in the wider framework of their concerns. For myself, I begin with a healthy respect for the judgment of most people. I always assume that if the way I look at the world seems to be very different from how other people look at the world, then I need to try first to empathise with their way, putting myself into their shoes. Methodologically we have developed a notion of bounded rationality to describe this assumption. Starting with this notion that most people make sense for themselves, one observes that people in Australia not only live, but seem to prosper in areas of high recurring natural hazard. Thus, one needs to study the process by which they do that. And one can't do that without a bit of professional modesty and not assume that you necessarily know the 'correct' human response to hazard.

But also I think that we have to recognise that there is a fundamental difference between individual and collective judgment. It seems to me that we haven't talked much about that, but it is really very important to recognise it. It may be that an individual can do something

that is really quite sensible for themselves, and yet may not be sensible for the collective good.

Most societies of the western world are highly mobile societies; if you actually look at the time for which people live in any one place, it is rather short. For example, even well settled people, for example farmers in our state of Iowa changed their farm management every nine years; farm ownership changed on the average every thirteen years. With such rapid change, it may be quite reasonable for a person to ignore a hazard that seems to have a point recurrence of the order of 25, 50, 75 or 100 years. And it may be even quite reasonable for disaster victims to say to themselves, having had a flood or drought experience, what is the likelihood of still another? The answer lies statistically in the binomial probability distribution, which is used to ask: what is the probability of being here (on this farm) 13 years and having zero hazard events, one event, two events, three events, four events? If you ask that question, it turns out that there is a large probability of having zero events and only a very small probability for two or more events. Thus, what may seem to be unwise or nonsensical from a long run viewpoint, makes sense from the point of view of the individual.

Nevertheless, the community is an ongoing social group. The community has continuing interest. If that farmer isn't there, some other farmer will be. And when the drought recurs or when the floods come again, or when the cyclone again crosses the coast, the community will have to respond to the full set of needs and demands made by the particular set of people then living there. Thus, one has to distinguish between individual good and collective community good. The community will still have a billion dollar loss in Darwin, but there will be a very different set of people living in Darwin if a cyclone comes back again. And so I think there is a limit to what one can learn from the individual studies. I think they are helpful, we certainly have done many ourselves. But I think you need to realise also that there is a real difference between individual rights and collective needs and to focus much more on societal studies of collective action and collective behaviours.

Finally, to complete this third point of critique, it seems to me that there is some problem about interpreting what we have discovered. For example, there was one paper that showed concern that only 75 percent of the people interviewed believed floods were a problem. Now to me 75 percent sounds like a lot of people, but apparently not to the authors. It is the familiar problem of the half glass of water, 'is it half full or half empty?' That is a question of judgment. I don't know what are the comparable figures in Australia for how many people who know the names of the members of parliament, but in the United States only about 50 percent of the people in an area know the name of their Congressman. When you get 75 percent of the people aware of anything, that sounds like a lot, and quite convincing. Inflation, getting the kids to school, fighting with the wife or husband - all these might be problems facing the interviewee on the day you did the interview. How much concern with floods should be expected?

To sum up, if I visited again (and I would hope that there would be an opportunity to do so), I'd like to see more sophisticated analyses of impacts of natural hazards. I'd like to see significant work done on the major adjustments of disaster prevention, of insurance, land use regulation, and the like. I'd like to see clarified, hopefully by research as well as by reflection, how you really feel about the people who live and work in areas the subject of natural disasters. Now if I could just suggest two directions to 'push them on ahead'.

RESEARCH PROSPECTS

A NATIONAL ASSESSMENT

First of all, I would like to strongly encourage you to complete what you have begun, a major assessment of Australian natural hazards. If you take the first set of papers (that I so cavalierly summarised) and invest some further work and effort, the potential is there for national assessment of the major natural hazards. Such assessments as Professor White has pointed out (chapter 2), have only been done in a few countries - the United States, Japan and the Soviet Union. The Canadians could have done so but haven't quite got to completing theirs. From Professor Balchin, I learn that the potential for such a task exists in the

United Kingdom but that it hasn't been done yet either. It seems to me that at least half the job for Australia has been done here at this symposium.

To help in such an assessment, I suggest three concepts for comparisons between hazards: a characteristic of the natural events, the human impacts and the societal response. In figure 38.1, I've taken the major hazards that were described during the symposium and tried to order them on these three dimensions.

The first of these dimensions is a useful way of ranking hazards by the natural events that give rise to the hazard rather than their impact on society. The natural events can be characterised (figure 38.1A) as on a continuum between pervasive and intensive hazard events. Pervasive hazard events impact large areas, are very slow of onset and long lasting, often over a period of years. They are characterised by relatively small amounts of energy applied per unit area. The classic of pervasive hazards is drought. On the other extreme, the archetypes of intensive hazards are earthquakes and tornados. They have very rapid onset - last for a very short time and yield enormous energies per unit area.

Between the extremes, we find floods, cyclones and bushfires. These can be called complex hazards. They have both pervasive and intensive phases. There are flash floods which are intensive and riverine floods which are regular, seasonal, and of long duration. Cyclones have an intensive phase when they cross the coastline, but when the cyclone stagnates and becomes a source of massive flooding, it behaves more in a pervasive mode. I think bushfires have these two phases as well. There is a very intense and rapid windblown phase, described to us as the period when most of the damages are done, and then a pervasive phase when the fires recur, smoulder and burn on.

Now let us add to this a further dimension (figure 38.1B) and consider various impacts, and how they are distributed along this continuum. If we begin with loss of life, the

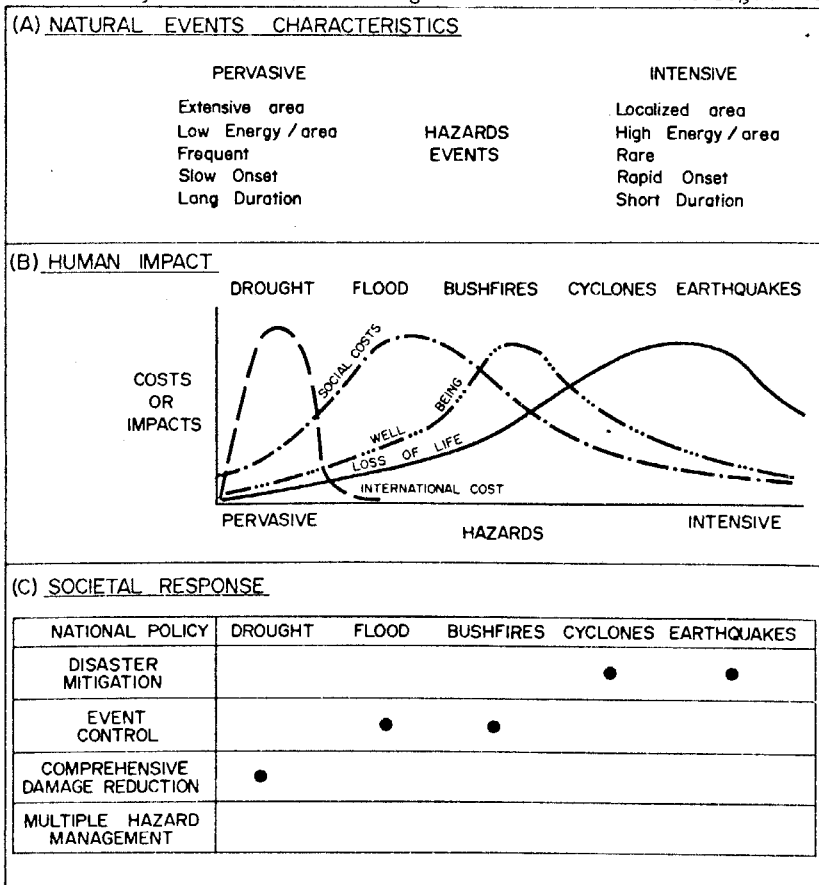


FIGURE 38.1
COMPARATIVE ASSESSMENT
OF MAJOR AUSTRALIAN
HAZARDS. Evaluation is
by (A) natural event
characteristics,
(B) human impacts, and
(C) societal response.

curve would appear something like that shown - potentially very high on the intensive hazards and low on the pervasive - hardly anyone dies of drought in Australia. Considering now social cost, which would include both costs of prevention and residual damages, it would tend to be a mirror image of life loss. If you consider an impressive but important quality that might be called well being of people or of an area (encompassing some of the issues Professor Douglas was talking about), distribution of loss of well being might peak somewhere in the middle. And, briefly, we can consider the international impact, though there was no mention of that in our meeting. It seems to me that the biggest danger of drought in Australia in the future may well be related to the world's food supply, considering the very special and unique role that Australia has, along with North America, in feeding the world. A simultaneous crop failure here in Australia with a crop failure of a big buyer such as the Soviet Union, coupled with perhaps a wet season in Canada, could have a serious international effect.

Examining the pervasive-intensive continuum for where the impacts fall explains in part the varied ways we react to each of these hazards. Some of them are dominated by loss of life, others by social and economic losses. I hope you might find this kind of framework useful in trying to get a national assessment.

We may also use this framework to consider a set of national policies. We have found that in our studies of many countries and their hazard policies, four major national policies develop sequentially in some countries but not in all countries. Such countries start out with a policy of disaster mitigation, essentially relief. If it's a very simple society, it may be simply by sharing with one another, through family or kin. Gradually, the state takes over, but almost solely limited to trying to relieve the misery of the disaster occurrence. This is then followed by event control, where the emphasis is on protective works such as what we have been calling flood mitigation in this meeting. Then there is a third policy with greater attention to comprehensive damage reduction, in which countries are concerned, for example, not only with controlling the flood event, but with reducing the vulnerability of people by encouraging people not to settle in flood-plains. Finally as a national policy, there is multi-hazard management, an application of comprehensive strategies by the same government agencies to a number of hazards.

Now it is not clear at all that the best national policy is the most complicated or that all the hazards should be dealt with in the same way. I have assessed the discussion that we have had over the last few days, and tried to judge which policy Australia follows in each of the hazards we have discussed. I think that earthquakes are clearly in a disaster mitigation policy and this seems appropriate. I would think it a waste as well as misleading to put earthquake warning signs outside of Adelaide, nor would I want to use space in the Adelaide telephone book to warn of earthquake hazard. Conversely societal response to drought is comprehensive. There is a wide range of adjustments employed in making crops less vulnerable to drought, all kinds of water management, and various types of aid and assistance. From what I heard here about the cyclone resistance of construction in Darwin and elsewhere, I would think that except for disaster mitigation and warning, there has been very little done on cyclones, and that they are still in the disaster mitigation policy. Bushfires and floods I would characterise as event control policies.

All of these hazard policies are changing. Now you may want to change my judgment a bit on a specific hazard, but this kind of framework gives you the opportunity to ask what's to be the proper response for each of these particular hazards. What is the policy appropriate to the Australian setting, to Australian national needs? The ability to worry about things and to organise people is a scarce resource, and one should try to make the policy appropriate to the need and not the other way around. The more complicated policies are not necessarily the most desirable ones. In general, it's good to have comprehensive damage reduction but, if it is a relatively minor hazard, that may not be justified, even though in another country it might be so.

NATURAL HAZARDS AND TECHNOLOGICAL HAZARDS

Now as to the second bit of direction that I would leave with you. It comes by way of inspiration from the natural hazards exhibit in the National Library*. I think it was a fine exhibit, but I don't know how many of you examined the little registration book and the

* Held at the same time as the Symposium, May 1976.

replies of the visitors. As you recall, the question asked of visitors was: What is the major disaster, natural hazard, in your home town? As I went through the list of answers I noted that some of the people had generalised their home town to the world. But let me just read to you a list that I copied from the visitors' book.

What is the greatest disaster in your home community?

Answer: Decline in breast feeding
Socialism
Excessive growth
Man's inhumanity and greediness
Car accidents
Fraser
Politics
Man himself
Demonstrations
Food shortage
Pollution from heavy industry
Nuclear power
Boredom

I think there is something profound in these responses and they help to give us a sense of perspective. A number of you were concerned about why were only natural hazards the topic of our discussion. Our visitors also extended their sense of hazards.

I have been similarly engaged along with a number of colleagues, through the project that was described to you of the Scientific Committee on Problems of the Environment (SCOPE). We have been trying to extend the kinds of insights that developed in our work on natural hazards, to the whole range of environmental hazards. We have asked of ourselves what is it that we know of from the natural hazards field that could be useful in trying to cope with the whole range of hazards of technology and, indeed, the hazards of life. In this effort, we have come across some disturbing and troubling issues as to what constitutes a hazard.

For example, there is a group of medical people who have developed an index of life changes. If someone has died in the family, or if you've moved to take a new job, or if you have been divorced, some kind of change has taken place - changes both favorable and unfavorable have been scaled by people as to their greater or lesser importance. Everybody has such experiences and using the scale one can total up their own index and see how much change they have had perhaps over the last two years. Now it turns out from some studies that if you have had very high scores on the index, say in the upper third or fourth, there is a 60 percent probability that you will have a major illness in the next two years. If you have a moderate index, there is a 40 percent chance that you will have a major illness in the next two years. The 'major illness' doesn't necessarily mean that you'll have cancer or a heart attack. It might be a bout of tonsillitis, which of course is quite major for adults. Or if the vulnerability of the body to life change is significant, we might ask if getting a promotion is a hazard? If you move from being Senior Lecturer in Adelaide to Professor in Melbourne, would that make you then vulnerable to a long case of the flu? Would you want, therefore, a stable society, a quiescent society, where everyone should maintain the status quo, and never get sick?

A second disturbing example is the recent increase in cancer in the United States even though it may be short-lived. Cancer has been increasing at a 1 percent rate for a number of years. It jumped to about 3.5 percent last year and the year before it was 1.8 percent. These are only signs, only points on the graph, we don't know their meaning. But environmental cancers have about a 20-40 year latency period. Even the children of asbestos workers have double the normal rate of cancer thirty years later and when you think of the enormous number of artificial substances that we inject into our environment, it becomes quite a scary picture.

There is a basic and significant difference between natural hazards and these hazards of technology in that we have universal human experience in dealing with natural hazards in contrast to technology.

The hazards of technology have not been experienced. We have not experienced, for example,

a major nuclear power disaster. We may not collectively experience in our lifetime a major disaster that might kill up to ten or twenty thousand people, but nonetheless we have to take account of such disasters in the course of trying to decide what's an appropriate nuclear policy for any nation or groups of nations. In this, we have to depend almost solely on science and technology and can rely little on experience. The perception of man-made hazards is the perception of scientists primarily. If we study it, we may have to study the sociology of science and the ways scientists think and make judgments. This becomes a much more specialised field than the kinds of things we have talked about in this symposium. We do not have the commonsense of people to rely upon, as we have in the natural hazard field.

Thus, the final notion that I will leave with you is a vision of the world carrying a set of worry beads. I am sure you know about worry beads, they are common in Mediterranean lands. They are carried, rubbed, twirled, in a comforting manner. Now imagine a bead for each of our worries and all having a fixed number of worry beads. Society can expand our worry beads by specialisation. We can set up a natural disaster organisation, which will take over some of the worries. But nonetheless even the society has a limit to the number of things it can worry about. Thus, we have to recognise that we only have so much capacity to respond to the threats that are around us, and that all of us tend to be rather extravagant about our particular favorite threats. But society as a whole has a problem greater than just the worries of natural hazards and the question remains - when and where shall it rub its worry beads.

Thus, in addition to asking and answering the question, how best can we respond to a specific natural hazard, we will have, in the years to come, to begin to look at the entire range of threats that face societies, and all humanity. We need to ask in a much more sharper, much more critical way, to which of these threats shall we turn our small wee stock of attention; to which of these are we to allocate our few worry beads?